

LEGIBILITY OF INK AND PAPER COLOR  
COMBINATIONS FOR READERS OF LARGE TYPE

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## LEGIBILITY OF INK AND PAPER COLOR COMBINATIONS FOR READERS OF LARGE TYPE

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### Introduction

As a result of the early research (1) conducted by personnel of the Cleveland Public Schools it was decided that black print on light buff or cream paper was best for large type books. Use of this combination has continued until recent years when one publisher of large type material has adopted an off-white color paper.

Several researchers have investigated the comparative legibility for normal readers of various ink and paper color combinations. Preston, Schwankl and Tinker (3) studied distance recognition thresholds for words printed in a variety of combinations. They found ink and paper color combinations legible in the following order: (1) blue ink on white paper, (2) black on yellow, (3) green on white, and (4) black on white. In another study (4), Tinker and Patterson found that materials printed in green on white, blue on white, and black on yellow were read from 3% - 4% more slowly than materials printed in black on white. Luckiesh and Moss (2) compared speed of reading and ease of reading for black print on 4 papers: white, fairly saturated yellow, light buff, and reddish orange. They found black on white gave the best reading speed and that light buff paper ranked highest in ease of reading.

The goal of the present study is to check some of these findings using a partially sighted group. Its purpose is to investigate the comparative legibility of blue and black print on papers of five different tints.

### Procedure

**Subjects:** Included were 12 boys in grades 5-11 of the Kentucky School for



the Blind. All were large type readers. Ages ranged from 11-17 years. Visual acuity for the better corrected eye ranged from 20/50 - 15/200 with a median at 20/200. A variety of types of visual disability was represented.

**Experimental Materials:** These consisted of paper circles around the periphery of which were printed 18 Landolt rings. The Landolt rings were printed in Job Black and Lustre Blue ink on the following papers: Sunray Opaque Vellum (white); Suede Book (off-white); India (light buff); Maxwell Offset (ivory); and Moraine Index (canary). The opening in the largest Landolt ring was 18/64 inch wide. The over-all dimensions of the targets were photographically reduced so that openings of successive rings were diminished in steps of 1/64 inch with the smallest opening being 1/64 inch. The direction of the opening was varied through 8 equally spaced circular positions.

**Apparatus:** The apparatus was constructed to provide for exposure of the targets at a distance 175 cm. from the plane of the eyes. Head position was held constant through use of chin and forehead rests. The subjects viewed the target through a slit 5 cm. x 13.5 cm. which was cut in a black opaque screen. The target was exposed through an aperture (diameter 4.3 cm.) cut in a screen of the same type paper as the target. This screen (12.5 cm. square) was mounted on a black background. The screen was illuminated by two Westinghouse 6W cool white 8 inch fluorescent bulbs mounted vertically on either side of the paper screen. The bulbs were shaded so that no light shone directly on the subjects. The size of the target was varied by the experimenter manually rotating a wheel upon which the target circle was mounted.

**Experimental Method:** The task for each subject was to identify correctly the circular position of the opening in the Landolt ring. The criterion, therefore, was one of size discrimination. A trial was started with the target opening size well above threshold. The size of the target was reduced through successive steps until the subject was unable to correctly state the position of the opening. Each



subject received 4 trials for each of the 10 paper and ink color combinations. For each combination, 4 paper circles were used with the position of the successive target openings independently-randomized for each. The order of the paper circle presentation for each color combination and the order of presentation for combinations were randomized for each subject. All randomizations used in the study were determined through use of tables of random numbers.

### Results

The data were cast in a treatments x treatments x subjects design and an analysis of variance completed. Mean size recognition thresholds and their standard deviations for each paper-ink color combination are reported in Table I. As

TABLE I

Descriptive Statistics\* for Size Discrimination Thresholds  
for the Group on 10 Paper-Ink Color Combinations.

Ink	white		off-white		Paper Light-Grey		Grey		Grey Light	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Black	7.77	3.04	7.77	2.91	7.83	2.68	7.73	3.25	7.29	3.45
Blue	7.64	2.69	8.02	3.15	7.54	2.79	8.00	3.32	7.92	3.30

\* expressed in sixtieths of an inch.

may be seen by inspection of this table mean size recognition thresholds were quite similar. Analysis of the differences between means for combinations revealed no significant differences. Results of this analysis are presented in Table 2.

The empirical results indicate, therefore, that under the conditions of the experiment all paper-ink color combinations were equally legible for the large type readers who comprised the group. However, subjective observations indicated that subjects made more effort to see some combinations than others and that differential fatigue effects may be involved. Legibility of combinations may differ



TABLE 2

## Results of Analysis of Differences between Means of the Ten Paper-Ink Color Combinations.

<u>Source of Variance</u>	<u>df</u>	<u>Mean Square</u>	<u>F*</u>
Ink	1	2.00	.85
Paper	1	1.25	.28
Subjects	11		
Ink x paper	4	3.25	1.75
Ink x subjects	11	2.36	
Paper x subjects	11	4.45	
Paper x ink x subjects	44	1.86	
Within groups	360		
Total	479		

\* None of the F-ratios reached significance at the .05 level of confidence.

among types of visual disability, i.e. the albino in the study objected to the very white paper. Other individuals also expressed dislikes with the canary paper most frequently mentioned in this category.

#### Summary

Size discrimination thresholds were obtained through repeated measurement of 12 large type readers using targets printed in combinations of two ink and five paper colors. Results revealed no significant differences in legibility among the various combinations.

#### References

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